

NOAA's Surface Weather Program

Each year about 7,400 people die and 700,000 are injured in 1.5 million weather-related crashes on the Nation's highways and roads. The economic impact is equally staggering - with \$42 billion in annual loss attributed to adverse road weather.

NOAA's Surface Weather Program applies the agency's multi-modal, multi-discipline environmental monitoring and prediction expertise to the surface transportation system. NOAA is partnering with the environmental and transportation communities to improve safety, mobility and productivity on the Nation's roads, rails and transit systems. Our goal is to develop opportunities and solutions that enhance safety and productivity when moving people and freight on the Nation's surface transportation system.



The Surface Weather Problem

Those who use the Nation's surface transportation system (defined as roads, rails, transit, and pipeline networks) need more timely, accurate and relevant environmental information to support their decisions. According to U.S. Department of Transportation (DOT) statistics, the ten-year average for weather-related fatalities on the Nation's roads and highways is approximately 7,400. Delay caused by adverse road weather has reached nearly one billion hours per year.

Additional DOT statistics show that adverse weather was a factor in nearly 25% of total highway crashes. Most of these occurred when the pavement was wet during and after rainfall. Reduced visibility and frozen/freezing precipitation (e.g. fog, snow, freezing rain) contributed to the remainder of crashes.

Surveys and assessments of traffic managers and road maintenance engineers have helped identify three fundamental deficiencies:

1. Lack of relevant surface weather observations and road condition data
2. Lack of road/environmental awareness
3. Lack of relevant weather and environmental analysis and prediction information, i.e. high resolution and at the transportation surface

The NOAA Surface Weather Program

The Surface Weather Program was chartered to bring NOAA resources to bear on the surface transportation problem, focusing on the three fundamental deficiencies previously noted. Many states have invested in Road Weather Information Systems (RWIS) to support road maintenance and traffic management. However, an operational system to integrate these observations nationally, and into multi-use formats does not presently exist.

A priority for the Surface Weather Program is to transition the Meteorological Assimilation Data Ingest System (MADIS) from research into operations. MADIS provides a data management architecture to integrate data (ingest, quality control, and output in standard formats) from disparate platforms and observation networks. The result is near real time data sets that can be used for numerous surface transportation and environmental applications: input to models; basis for traffic management or road maintenance decisions; traveler information services; and data to improve weather and hydrologic warnings and forecasts. Once transitioned to operations, MADIS will serve as the 'National Surface Weather Observing System,' to provide the surface transportation enterprise (public, private, and academic/research organizations) with transportation-relevant, high quality environmental data in near real time.

To help improve awareness and public service, NOAA and DOT's Federal Highway Administration recently established a formal partnership. An early outcome of this partnership is a collaborative effort to inform state road maintenance and traffic managers about NOAA services. Also, NOAA's National Weather Service meteorologists and management are being informed about the weather requirements of state and local DOTs.

NOAA is committed to improving data assimilation techniques that will facilitate prediction at the finer temporal and spatial resolutions required to support the surface transportation system. To ensure weather and environmental information is relevant to the surface transportation system, further research on known weaknesses is needed. This includes, for example, research to improve the accuracy of atmospheric boundary layer (the layer near the surface) prediction models.

Additionally, NOAA is committed to providing infrastructure and basic data that supports private sector opportunities to offer detailed route and application-specific analysis and prediction services to the surface transportation community.

Benefits

Imagine trip planning that automatically factors weather and road conditions into route selection, travel time, and traffic management. Imagine



weather information for surface travel available at your fingertips or by voice command in your vehicle. Imagine vehicles themselves providing environmental data and road conditions and sharing this data with meteorologists, transportation managers and even nearby vehicles.

Imagine driving to work when suddenly a warning to **STOP NOW** flashes on your dashboard or windshield and a message from your vehicle's sound system tells you, "Icy road, accidents ahead – stop now!" This warning, courtesy of data from roadside sensors and fellow drivers' vehicles ahead, will allow you to take action before you encounter the hazard! Continued government/industry partnerships and multi-discipline research are now occurring to make this and many other scenarios a reality.



Another significant benefit of additional and higher resolution environmental data for surface transportation will be realized by the Nation's freight industry, and in particular, trucking. The smooth flow of freight is important to our Nation's economy and to maintaining our global connectivity as imports and exports flow through our ports and airports and across our borders north and south. Every U.S. export or import will most likely, at some point in time and on truck or rail service, move on the surface transportation system. Improved surface weather information combined with smart infrastructure will allow freight companies (road and rail) to operate more efficiently and safely from harbors and airports over land to their destination. This will occur by leveraging favorable weather conditions and avoiding hazardous or impeding weather.



As demand for freight transportation grows, so do the demands for efficiency and productivity. Environmental data relevant to the surface transportation system helps reduce the cost of doing business. By including timely and accurate environmental data into their operating models, the freight industry can better utilize people and equipment and provide more reliable service. These

benefits are then passed on to retailers, distributors, wholesalers, factories and manufacturers who can save costs by carrying smaller inventories.

Manufacturing industries can utilize 'time dependent' production strategies with greater assurance that materials will arrive when expected. If the weather conditions do change and materials are expected to be delayed, freight companies will be able to provide more accurate and advanced notice to their customers, allowing them additional response time to adjust tasks and labor priorities.

Weather information relevant to the surface transportation system, when combined with road condition data and intelligent freight routing models, can allow dispatchers to reroute their fleet to utilize alternate routes well in advance of congestion and significant delays associated with adverse road weather events, e.g., snow, ice, flooding, dense fog, etc. This also results in the positive environmental effects of reducing emissions and wasted fuel associated with idling in traffic congestion. Another benefit is the optimal utilization of capital and labor resources by keeping the fleet moving toward destinations.

Damage to the environment and expense from the over-application of winter maintenance chemicals will decrease due to better surface weather data and short-term predictions. The efficiency of traffic flow will increase through management practices informed by more relevant, timely, accurate and higher resolution surface weather and road condition information.

NOAA's Commitment

NOAA is contributing its environmental monitoring and prediction expertise to partnerships dedicated to reducing economic loss and weather-related deaths and injuries on the Nation's surface transportation system. Partnerships among industry, government and the research community, combined with rapidly evolving technology and increased awareness of weather impacts, will help reduce the occurrence of weather-related crashes on the roads, rails or transit systems.

Although one of many contributors to improving the safety and efficiency of the surface transportation system, NOAA plays a pivotal role in providing a foundation for the environmental needs of this important community. The Surface Weather Program will advocate needs of the surface transportation enterprise within the agency and is committed to improving the level of service that supports the Nation's surface transportation system.

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